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WHAT IS CLAIMED IS:

1. A bed occupant monitoring system comprising:
  - (a) a pressure sensitive member coupled to a support member for supporting a bed occupant, the pressure sensitive member comprising  
5 a plurality of pressure sensors, each of the pressure sensors configured to provide an optical pressure signal having an intensity which varies with a pressure applied thereto;
  - (b) at least one wave energy source coupled to the plurality of pressure  
10 sensors for providing wave energy to the plurality of pressure sensors; and,
  - (c) at least one wave energy detector coupled to the plurality of pressure sensors for converting the optical pressure signals into electrical pressure signals.
- 15 2. A bed occupant monitoring system according to claim 1 comprising interface electronics with threshold circuitry for comparing the electrical pressure signals to a predetermined threshold.
- 20 3. A bed occupant monitoring system according to claim 2 wherein the threshold circuitry comprises a threshold comparer for determining if the electrical pressure signals are below the predetermined threshold.
- 25 4. A bed occupant monitoring system according to claim 3 wherein the threshold circuitry further comprises a threshold crossing detector configured to reset a timer when the electrical pressure signals cross the predetermined threshold.
- 30 5. A bed occupant monitoring system according to claim 4 further comprising an alarm signal generator coupled to the timer and the threshold comparer by means of an AND gate, the alarm signal generator configured to generate an alarm signal if the timer is not reset for a predetermined time period and the electrical pressure signals are below the predetermined threshold.
- 35 6. A bed occupant monitoring system according to claim 1 comprising a signal concentrator connected to receive a plurality of the electrical pressure signals and to output a combined signal indicative of a property of said plurality of the electrical pressure signals.

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7. A bed occupant monitoring system according to claim 1 comprising a signal concentrator connected to receive a plurality of the optical pressure signals and to output a combined optical signal indicative of a property of said plurality of the optical pressure signals to the at least one wave energy detector.
8. A bed occupant monitoring system according to claim 1 wherein the pressure sensitive member comprises a top foam layer and a bottom foam layer, and wherein each pressure sensor comprises a pair of optical fibres having ends between the top foam layer and the bottom foam layer, each pair of optical fibres comprising an input fibre coupled to the wave energy source and an output fibre coupled to the wave energy detector.
9. A bed occupant monitoring system according to claim 1 wherein the pressure sensitive member is constructed from a compressible material, and wherein each pressure sensor comprises a pair of optical fibres having ends within the compressible material, each pair of optical fibres comprising an input fibre coupled to the wave energy source and an output fibre coupled to the wave energy detector.
10. A bed occupant monitoring system according to claim 9 wherein the support member is constructed from a compressible material having an elastic modulus which is substantially the same as an elastic modulus of the compressible material of the pressure sensitive member.
11. A bed occupant monitoring system according to claim 1 wherein the pressure sensitive member comprises an area of a mattress constructed from a compressible material, and wherein each pressure sensor comprises a pair of optical fibres having ends within the compressible material, each pair of optical fibres comprising an input fibre coupled to the wave energy source and an output fibre coupled to the wave energy detector.
12. A bed occupant monitoring system according to claim 1 wherein each of the pressure sensors is responsive to pressure in a range of 1 to 15 mmHg.

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13. A bed occupant monitoring system according to claim 1 wherein the wave energy source is coupled to the plurality of pressure sensors by means of optical fibres.
- 5 14. A bed occupant monitoring system according to claim 1 wherein the wave energy detector is coupled to the plurality of pressure sensors by means of optical fibres.
- 10 15. A bed occupant monitoring system according to claim 1 comprising an indicator device.
16. A bed occupant monitoring system according to claim 1 wherein the wave energy detector comprises a photodetector.
- 15 17. A bed occupant monitoring system according to claim 16 wherein the photodetector comprises an array of photo-diodes, and wherein each of the photo-diodes is coupled to one of the plurality of pressure sensors by means of an optical fibre.
- 20 18. A bed occupant monitoring system according to claim 1 wherein the support member comprises a mattress, and the pressure sensitive member is positioned atop the mattress.
- 25 19. A bed occupant monitoring system according to claim 1 wherein the support member comprises a mattress, and the pressure sensitive member is positioned below the mattress.
20. A bed occupant monitoring system according to claim 1 wherein the support member comprises a mattress, and the pressure sensitive member is positioned within a cavity in the mattress.
- 30 21. A bed occupant monitoring system according to claim 1 wherein the support member comprises a mattress, and the pressure sensitive member is positioned in a recess near a top of the mattress, such that a top surface of the pressure sensitive member is flush with a top surface of the mattress.
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22. A bed occupant monitoring system according to claim 1 wherein the support member comprises a mattress, and the pressure sensitive member is positioned in a recess near a bottom of the mattress, such that a bottom surface of the pressure sensitive member is flush with a bottom surface of the mattress.
23. A bed occupant monitoring system according to claim 1 wherein the plurality of pressure sensors are arranged in an array across a width of the support member, comprising signal processing means for determining a position of the occupant on the support member.
24. A bed occupant monitoring system according to claim 23 wherein the plurality of pressure sensors are arranged into a central group and two side groups, with the side groups positioned adjacent to edges of the support member and the central group positioned therebetween, and wherein the signal processing means are configured to calculate a total applied pressure for each group.
25. A bed occupant monitoring system according to claim 1 further comprising an opaque covering material for shielding the pressure sensors from ambient light.
26. A bed occupant monitoring system according to any one of claims 8 to 11, 13, 14 or 17, further comprising a protective sheath covering the optical fibres between the pressure sensitive member and the interface electronics.
27. A method of monitoring a bed occupant occupying a bed with a pressure sensitive member coupled thereto, the pressure sensitive member comprising a plurality of pressure sensors, each of the pressure sensors configured to provide a reflected wave energy pressure signal by reflecting incident wave energy with an intensity which varies with a pressure applied thereto, the method comprising:
- (a) applying wave energy to the pressure sensors; and,
  - (b) measuring pressure signals received from the pressure sensitive member.

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28. A method according to claim 27 comprising processing the measured pressure signals by taking a sum of a time derivative of the absolute values of the pressure signals.
- 5 29. A method according to claim 27 comprising processing the measured pressure signals by taking a sum of a time derivative of the pressure signals.
30. A method according to claim 27 comprising processing the measured pressure signals by taking a sum of a time derivative of the squared pressure signals.
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31. A method according to claim 27 comprising comparing the measured pressure signals to a predetermined threshold.
- 15 32. A method according to claim 31 comprising generating an alarm signal if the measured pressure signals remain below the predetermined threshold for a predetermined time period.
- 20 33. A method according to claim 32 wherein the predetermined threshold and predetermined time period is set in relation to an expected heart beat pressure signal.
34. A method according to claim 32 wherein the predetermined threshold is set in relation to an expected pulmonary pressure signal.
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35. A method according to claim 32 wherein the predetermined threshold is set in relation to an expected bodily movement pressure signal.
36. A method according to claim 27 comprising computing a heart rate of the bed occupant from the measured pressure signals.
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37. A method according to claim 27 comprising computing a respiration rate of the bed occupant from the measured pressure signals.
- 35 38. A bed occupant monitoring system comprising:

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- (a) a pressure sensitive member coupled to a support member for supporting a bed occupant, the pressure sensitive member comprising a plurality of pressure sensors;
  - (b) interface electronics coupled to the pressure sensors for producing at least one pressure signal; and,
  - (c) threshold circuitry for comparing the pressure signals to a predetermined threshold.
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39. Any and all apparatus comprising a novel and inventive feature, combination of features, subcombination of features as described or clearly inferred from the description above.
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40. Any and all methods comprising a novel and inventive act, combination of acts, subcombination of acts, step, combination of steps, subcombination of steps as described or clearly inferred from the description above.

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